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AUTHOR Mannering, Linda W.; McKinney, Richard L.
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MICROCOMPUTERS VERSUS MAINFRAME COMPUTERS: SELECTING THE APPROPRIATE COMPUTING TOOL IN INSTITUTIONAL RESEARCH

OFFICE OF INSTITUTIONAL RESEARCH AND PLANNING
UNIVERSITY OF KANSAS

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The paper sets the stage for the effective and efficient use of computers in institutional research. The microcomputer and the mainframe computer are contrasted for those researchers who have a choice of where to process data. General computer use, specific microcomputer and mainframe computing guidelines, and an application utilizing both computer types are presented. General considerations touch upon attitudes, expectations, and organizational habits for the purpose of establishing what can or cannot be done with a computer. The guidelines highlight strengths and weaknesses in dealing with microcomputers and large mainframe computer systems and delve into areas of data control, data accessibility, standardization of procedures and documentation, system support and user education, hardware limitations, and software support. The discussion of the application shows how computing tools were chosen.

MICROCOMPUTERS VERSUS MAINFRAME COMPUTERS: SELECTING THE APPROPRIATE COMPUTING TOOL IN INSTITUTIONAL RESEARCH

The institutional researcher is required to perform rigorous analysis on data from many sources that may be organized on paper or in machine readable form. The advent of the microcomputer permits a freedom of manipulation and analysis of machine readable data that was not possible in the past. Even for those who have access to large computer systems with highly permutable databases, the microcomputer is extremely useful. If the capabilities and limitations of the microcomputer are clearly established, it can be a valuable tool. A contrast of the microcomputer and mainframe further clarifies some of the characteristics of the microcomputer and provides information that may be useful to researchers who have a choice of where to process data. This paper focuses on some general considerations about computers, specific guidelines, and applications that have evolved from several years of experience with the mainframe system and several months of use of a microcomputer in the Office of Institutional Research and Planning at the University of Kansas.

General considerations briefly touch upon attitudes, expectations, and organizational habits with the purpose of establishing what cannot or should not be done with a computer. The suggestions set the stage for the effective and efficient use of computers in institutional research. A positive attitude and good organizational skills will enable the institutional

researcher to establish realistic expectations of computers and their uses.

The guidelines highlight strengths and weaknesses in dealing with microcomputers and large mainframe computer systems. These guidelines touch on areas of data control, data accessibility, standardization of procedures and documentation, system support and user education, hardware limitations, and software support. They can be used by the institutional researcher in directing applications to the microcomputer, the large computer system, or a combination of the two. The minicomputer is not ignored in this paper but simply not included because one has not been available to the Office of Institutional Research and Planning at the University of Kansas.

User work experiences have been particularly useful in developing these guidelines. In the discussion of applications it is shown how computing tools were chosen.

GENERAL CONSIDERATIONS

The institutional researcher must understand what can and should be placed on microcomputers and mainframes when both systems are available. The microcomputer user will look upon the compact machine with satisfaction because it is accessible. With the proper software, it can save hours of working time. The microcomputer will probably be looked upon as an intruder by data processing personnel who have, up until now, exercized a centralized control over data security, access, and maintenance. The user may see the microcomputer as a means to store and manipulate any information that he or she needs but the data

processing personnel may find it to be a threat to an established order of data collection, and offer little support or encouragement for its use. Some institutional researchers may be fortunate to work in an environment where the microcomputer has been integrated into a centralized system. However, many institutional researchers may have to deal with one system or the other, and will be forced to choose where to place applications. The institutional researcher will need to adopt a positive yet discriminating attitude towards what should be placed on stand-alone versus centralized systems to avoid duplication of information and efforts throughout different parts of the university.

Organizational habits in the office are not improved by a computer. The introduction of computers into daily work will compound problems rather than eliminate them where files are already unorganized or when managers or staff have undefined goals. The computer will produce useless output with great efficiency if either the data or the analyses are haphazard. Wilson says that, "Computers are dumb critters. They grow smart, efficient, and powerful at the same pace you do, no faster." (1) This is particularly true in the case of the microcomputer where each user assumes total control over machine functions, data maintenance, and data processing. Institutional researchers who do not have the time or the organizational habits will do well to find someone who is capable of assuming these responsibilities.

The user's expectations of computers will be more realistic when they realize that the presence of a computer in the office

does not imply that all duties should be automated. The user should keep in mind that computers perform best when doing repetitive work. Computers require exacting and sometimes exasperatingly detailed instructions and the user should place on the computer only frequently accessed information or data that must be kept in machine readable form. In his hints on using general application software, Pogrow says, "Computerize only those portions of the data that are causing the most problems. . . . Enter only that data for which the time savings for computerization far exceeds the time required to enter the data into the systems." (2) Some examples of inefficient computer-usage are: 1) one-time documents, memos, or letters that could be more quickly typed than word-processed, 2) calendars that require more input and update time on a computer than in an appointment book, and, 3) reference materials that are already in an easy to use printed form.

DISCUSSION OF GUIDELINES

This section of the paper surveys the strengths and weaknesses of mainframes and microcomputers when the two are viewed as distinct systems. The outstanding difference between these systems lies in the amount of user control. The stand-alone microcomputer gives the user total control over the machine and the data, whereas the mainframe environment is laden with safeguards, security systems, program interfaces and operating personnel, sometimes to the point of inaccessibility. The microcomputer is much more accessible than a mainframe. The advantages and disadvantages of user versus second-party control

become obvious in the following areas of discussion. The guidelines are summarized in table 1.

Data Entry, Maintenance, and Documentation

The microcomputer user is solely responsible for data entry, file maintenance, and documentation. Ample time must be devoted to implement a system of documentation. Someone with an overview of the applications placed on the microcomputer might be the preferred person to initiate and supervise this system. The benefits of documentation are far-reaching because users will utilize organized data more often and more efficiently. Gates points out that, "One of the most appealing features of personal computers is that their programs can be tailored to fit an individual's needs. This same feature makes it very difficult for someone else to use an existing system without good documentation"(3).

Some documentation procedures are: 1) the tracking of data that has been distributed, either on paper or in machine readable form, 2) the recording of changes in files or the discarding of files, 3) the meaningful assignment of names to files, and 4) an orderly approach to indexing those files. Back-up files created from periodic duplications of active files must also be documented.

On large computer systems, most of the documentation and nearly all of the data entry and maintenance are routinely done by staff assigned to these jobs. The duplication of information called "backing up files" is usually performed daily and restored when the user needs it. However, data validity and completeness

Table 1

Summary of Guidelines for Selecting
The Appropriate Computing Tool

Area	Microcomputer	Mainframe
Accessibilty of Data	Immediate access.	Delayed. Subject to approval of those who supervise data and data extraction.
Data Control	User controls data entry, updates, documentation and distribution.	Data entry performed by others. Data must be checked for validity and reasonableness.
Operations	User responsible for equipment, supplies, hardware and maintenance of computer and other peripheral devices.	Assigned staff work behind the scenes.
Data Storage and Maintenance	User responsible for systematized storage, back-ups, care of floppy diskettes, hard disks and tapes.	Librarians maintain systems of storage, and archive back-ups.
Printing	Quality depends on user's investment. Printing generally slow.	Different types of printers available. Queues facilitate speed and efficiency.
Support	Manuals, some books. Some user's groups or clubs. Almost no applications support. Occasional telephone software support.	Full-scale training, consulting, manuals, telephone assistance, Other user support within the institution.

	Microcomputer	Mainframe
Standardization	Some standards and operating systems prevail, but unreliable in data exchanges. Must have same make and model machine and operating system. Modems facilitate data exchange between different machines.	Standards of data structure, maintenance, extraction, programming languages, forms, and documentation within same institution.
Manageability of Data	Small databases. Restricted to files that do not slow processing significantly because of size. Interactive data processing is very efficient.	Large databases are very efficient. Optional ways to manage large amounts of data. Interactive processing is usually cumbersome.
Data Analysis	Interactive spreadsheets and graphics are good (with a letter quality printer). Statistical analysis may be limited by size of sample data permitted with micro storage devices.	All types of analysis performed on very large or normal files. Statistical capabilities include all types of measures.
Security	User supplies hardware, software, and data security against loss and theft. Password protection not provided.	General user security. Limited access to files. Restricted access to hardware.
Ease of Use	User-friendliness depends on software and operating system.	Extensive training required.
Other	Good word-processing packages available.	

cannot be guaranteed as is the case on the microcomputer where the user oversees his/her data.

Hardware and Data Storage

The hardware limitations on the microcomputer are memory space and data storage. The amount of memory required for data processing depends upon the memory space used by programs which do the legwork for the user. The memory is occupied by instructions with only a small area allocated to data. The more complex the task, the more space that is consumed for execution of all the detailed instructions. For this reason, BASIC, which has very compact instructions, is often the most common microcomputer language. Graphics and color also require substantial memory size. Expandable memory units are readily available and give the microcomputer the memory capacity to deal with complex programs. Memory size is not an issue with mainframes. The power in mainframe computing lies, in part, in enormous memories that can handle any size and complexity of program.

Common data storage devices are diskettes, fixed disk drives, and tapes. Mainframe systems may use all forms of data storage but usually rely heavily upon fixed disk drives and tapes. Until recently, microcomputers have most often relied on floppy diskettes for data storage. Now, hard disk drives are available at reasonable prices and greatly improve storage and data manipulation capability of the microcomputer. The floppy diskette provides adequate storage until they become too numerous to control. Since the hard disk holds at least thirty times more

data, it gives the user faster access to files than the floppy and simplifies documentation by keeping all files in one place. Data storage constraints on the microcomputer may soon be a thing of the past as hard disks and superior tapes become available and reasonably priced. Data storage limitations on a mainframe system are virtually non-existent.

It is possible to calculate the capacity of the floppy diskette with a simple formula that will give the number of records (regarding files of information) or the number of pages of text that will fit on a diskette. Determine the number of bytes on the diskette expressed in K's (where K is equal to 1024 bytes) by counting the number of characters in the record or the page of text and using that number to divide into the total number of bytes on the diskette. This gives the number of records or pages of text available to you on the diskette. Each character represents one byte. Subtract approximately five thousand bytes to allow for the formatting commands and directory.

On a final note, Pogrow has recommended that databases that exceed the capacity of two floppy diskettes will be better handled on a hard disk and that the manipulation of more than ten thousand records requires the capacity of a mini or a mainframe computer (4).

Printing and Operations

In general, as the quality of the print improves, the speed of output slows (except on very expensive printers). Most microcomputers may come with small printers that are slow and do

an adequate job of printing at best. In most cases, the microcomputer screen or video is frozen with the document that is printing until the printing is completed. Some software (i.e., WordStar) does permit limited editing of another file during the print process. Nearly all packages have provisions for spooling which frees up the video after the document is spooled to another diskette. Unless the microcomputer is attached to a fast (and expensive) printer, the printing of files and documents will be slow. The user must attend to operational duties such as changing paper, ribbons, and print fonts and sizes. On one hand, it is satisfying to print any document that has been created or revised, but on the other, it can be annoying when operational problems occur.

Printing on large computer systems is facilitated by print queues that schedule requests depending on the availability of printers. The speed of the printer is not a significant factor when queues schedule printing and the terminal which is on-line to the mainframe is freed the moment a job is placed in the queue. Furthermore, all the operational tasks of changing paper or forms are taken care of by operations staff who also handle equipment failures.

Support Structures

The support structure is another factor of importance when using microcomputers and mainframes. The user versus the second party control over procedures and operations makes for notably different approaches in learning how to use these systems. Large systems typically provide assistance to the user in data access

decisions, data reliability, and data collection. This usually occurs through a formal structure as well as friendly relationships that exist between users and operators of the system.

The microcomputer user is confronted with a perplexing situation. If there is no integration of the microcomputer into a centralized computing system, there may not be any institutional support. When there is little or no support from the institution, microcomputer education tends to be self-taught. Some support may be provided through software manuals that give general examples and detailed technical information. The user must infer from the examples and imagine what can be done considering the capabilities of the machine and the software provided. The institutional researcher who is not included in a structured microcomputer system or does not have contact with other users may become frustrated with applications problems.

Data Distribution and Standardization

One of the roles of the institutional researcher is to distribute uniform information. The large databases associated with mainframes guarantee uniformity but may be inaccessible to administrators and potential users. Only through the standardization of operating systems will the microcomputer become a true facilitator in uniform data distribution. Designers of microcomputers have created chaos in the computer world by independently developing their own operating systems. Even though the movement towards standardization has taken hold, it is evolving slowly. With like operating systems, data

exchange and distribution using diskettes is feasible. Institutions can insure an effective network of data exchange by insisting that microcomputers be of the same make and model with matching operating systems. However, the use of modems to distribute data to unmatched machines and operating systems also can be effective as long as the files to be transferred are not too large.

Telecommunications systems that transfer data over telephone lines have been developed and will facilitate data exchanges. This may alleviate some of the problems related to the standardization of operating systems. In his article that speaks directly to these problems, Gabel states that the modem "is an inexpensive piece of equipment that converts serial data from your computer into data that can be sent over the telephone line. So if you want your computer to speak with Sam's computer at the other end of the office, you simply get a modem for each computer"(5).

Hardware, Software, and Data Security

It was mentioned previously that data entry, maintenance, and access are the responsibility of the microcomputer user. In the areas of hardware, software, and data security, the microcomputer user also assumes the responsibility for the machine, peripheral devices, and all software and data. The large computer system provides for nearly all types of security. The mainframe is safely situated in a building surrounded by persons concerned with the functioning of the machine. This may not always be the case with a microcomputer. More importantly,

though, is the security of data. A diskette can be easily lost, damaged, or stolen. Data maintained on-site as well as licensed software must be safely stored and supervised.

Extraction and Analysis of Data

Data on large computing systems are extracted by trained programmers. The user of the microcomputer may have these skills, but usually software designed for microcomputers can be easily managed by non-programmers. Users may learn the basic skills of extracting data on the microcomputer in hours or a few training sessions. In many instances, the use of menu-driven databases, spreadsheets, and word-processing packages permits the extraction, manipulation, and analyses of data much more quickly than is possible for the mainframe programmer with greater resources. One of the virtues of user-friendly software is that it is widespread on microcomputers and makes data accessible to many more people with a minimal knowledge of how the computer may actually work.

Some of the benefits of working in a situation where both the mainframe and microcomputer are available include: 1) tasks that were previously in the domain of programmers can be performed by non-programmers, 2) programmers have the technical understanding to create models of data organization and may teach these skills to others, 3) those who analyze data will usually have greater satisfaction and acquire new insights by manipulating their own data, 4) mainframe programmers are relieved of providing one-time or special analyses that can be more quickly performed on microcomputer databases, spreadsheets,

or word-processing packages. 5) non-programmers may develop a better understanding of the common difficulties or restrictions faced by programmers.

The types of data analyses performed on mainframes are limited by programming languages and software packages on hand. Complex mathematical analyses and statistical measures can be done with large quantities of data but that is not the case with microcomputers. A few statistical packages are available for microcomputers but they are hampered by storage limitations. Statistical analysis that requires a sample size of ten thousand records or more can be done only on minicomputers or mainframes. Mathematical capabilities, often referred to as "number crunching," are feasible on the microcomputer only if additional hardware (i.e., special memory boards designed to perform only mathematical instructions) become available to the user.

Data analysis through interactive processing has secured a prominent place for the microcomputer. These interactive capabilities work well on single-user systems that allow the user to test the "what if" problems on "live" data. The mainframe does not efficiently process constant value changes that occur in interactive processing. Time-sharing in general slows down large computer systems.

Ease of Use

As pointed out previously, the mainframe must be accessed by trained programmers. Programming and control languages permit them to tread through a highly structured and complex system of data management. Errors on a mainframe can have implications for

many users and are serious when they have caused loss of data. Costs in lost time multiply rapidly in a mainframe multi-user environment when the system crashes due to any number of reasons including user error. In contrast, the microcomputer permits a margin of error that would be unthinkable on the mainframe. The dangers of losing data are minimal if simple procedures are followed for copying operating system diskettes and backing up data files. The good-natured single-user is more willing to adventure into the mysterious capabilities of the microcomputer and explore software, when he or she is the sole victim (who nearly always survives) of slip-ups.

Those who design software for the microcomputer often try to give the user as much help and on-screen guidance as possible without slowing down the processing significantly. Generally speaking, much of the software available for the microcomputer is considered to be user-friendly because it is easy to use by the lay-person. The non-programmer may never learn to use the mainframe system for more than data entry or word-processing, but the same individual with some assistance can learn to create models on the microcomputer and perform some sophisticated extractions and analyses of data as a result of the user-friendliness of the software.

APPLICATIONS

An IBM mainframe computer has been available to institutional researchers at the University of Kansas for several years. This year the Office of Institutional Research and Planning acquired a Zenith Z-100 microcomputer. The staff

were anxious to learn how to use the microcomputer and after some preliminary experiences decided to embark upon some serious applications. Those on the staff who took the most interest in the microcomputer were accustomed to typing, proofing and double-checking reports that summarized data generated from mainframe programs. Some of those reports, done periodically, presented mainframe generated data in formats which would be time-consuming to program on the mainframe. A report that would be difficult to manage on the mainframe presented several year's worth of data on a grid so that end-users could quickly survey the information and draw conclusions or make recommendations. The emphasis in this office has been to utilize the microcomputer for summary reports from mainframe-generated data. The application discussed in this section shows how both the mainframe and microcomputer have been used to extract, store, manipulate, and present data.

The memberships study will be viewed in detail as an example of the type of application that has been placed on the microcomputer in this office. The purpose of the discussion is to show how decisions to use the computing tools available in this office were made. Not all of the decisions were made at the onset of these applications. Some were a result of software limitations. Others came about when new types of data manipulation were discovered. This example, while narrow in scope, will encourage other institutional researchers to consider optional ways that information could be organized and presented with a microcomputer. The institutional researcher may also note with some interest that the microcomputer application described in this section involved staff members, particularly non-

programmers, in decision-making.

The methodology for the fiscal year 1983 memberships study is described in detail as follows. The focus of the discussion is on the reasons for choosing computing tools rather than on the content of the study. The study was requested by the Executive Vice Chancellor to analyze the professional associations in which departments have memberships during a fiscal year. In previous years, this particular study had been done entirely by hand. One of the motivating factors to computerize the study was so that annual updates could be made easily and efficiently. The final report of the memberships study seemed to be an appropriate application for the microcomputer. The study proceeded in three steps (see the flow diagram in figure 1). The steps were:

Step 1: The first step of the memberships study was performed on the university's IBM 370 computer. The input data for this step was the year-end master of accounting transactions for fiscal year 1983. Only the transactions that had been assigned an object code of 291 (subscriptions and memberships) were selected. Some subscriptions that were easily recognized through association with known vendors were automatically eliminated. This step created a report which was used in subsequent steps. An example of this report is shown in figure 2.

Step 2: The second step was a manual check of the report created in step 1. It was the most time-consuming step. Paper copies of vouchers kept by Voucher Audit were checked to gather the required information. It was during this step that additional subscriptions were eliminated. Two lists were

FIGURE 1

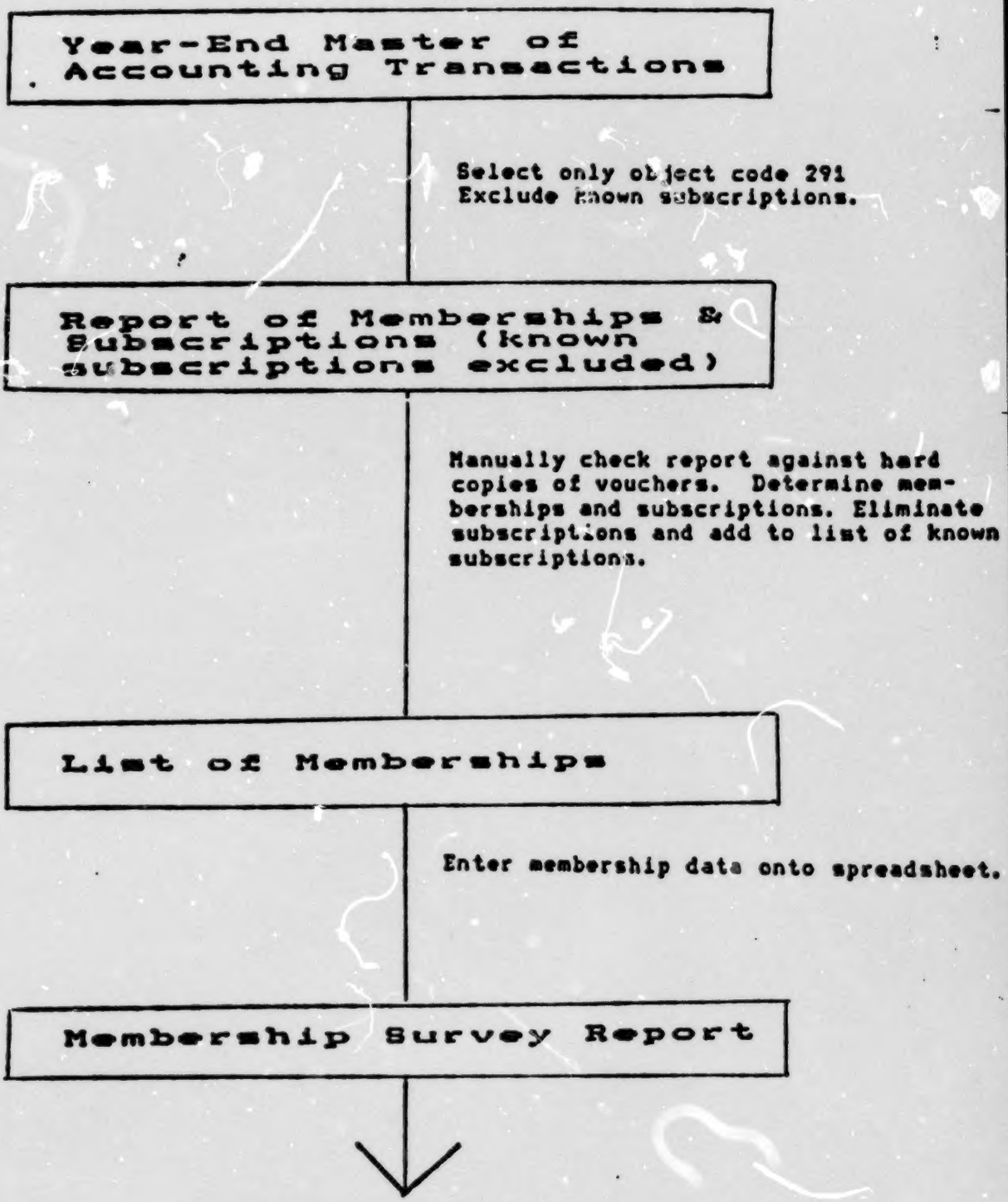
Year-End Master of Accounting Transactions
Select only object code 291
Exclude known subscriptions.
Report of Memberships & Subscriptions (known subscriptions excluded)
Manually check report against hard copies of vouchers. Determine memberships and subscriptions. Eliminate subscriptions and add to list of known subscriptions.
List of Memberships
Enter membership data onto spreadsheet.
Membership Survey Report

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FIGURE 2

PAGE 1

EXPENDITURES FOR OBJECT CODE 291
FISCAL YEAR 1983

DPT	BC	FLAG	TRAN DTE	TRXN NUMBER	PRIOR REFER TXN-NUMBER	VENDOR NAME	TRANS DESC	EXP AMT
1500 CHANCELLORS OFFICE								
1500	60	0002	01-03	V04235701	AJ956330	KYLE THOMPSON	PAY W/C EACU	40.37
1500	60	0002	01-20	I0831750	AJ466250	DEPT OF ADMINISTRATION	PAY W/C EACU	36.50
1500	60	0002	01-26	I0830730	AJ466150	DEPT OF ADMINISTRATION	PAY W/C EACU	151.90
1500	60	0002	01-29	JV0201801	V0000820	CHRONICLE OF HIGHER ED	PAYMENT ACJU	37.00
1500	60	0002	01-29	JV0202001	V0017220	NEW YORK TIMES	PAYMENT ACJU	55.50
1500	60	0002	01-29	JV0202101	V0019250	KYLE THOMPSON	PAYMENT ACJU	40.37
1500	60	0002	01-02	V01E0640	AJ466250	KYLE THOMPSON	PAY W/C EACU	40.37
1500	60	0002	02-25	JV0212E02	V0000820	CHRONICLE OF HIGHER ED	PAYMENT ACJU	37.00
1500	60	0002	02-29	JV0212902	V0019250	KYLE THOMPSON	PAYMENT ACJU	40.37
1500	60	0002	02-29	JV0212102	V0017220	NEW YORK TIMES	PAYMENT ACJU	55.50
1500	60	0002	02-25	JV0212801	V0000820	CHRONICLE OF HIGHER ED	PAYMENT ACJU	37.00
1500	60	0002	02-29	JV0212901	V0019250	KYLE THOMPSON	PAYMENT ACJU	40.37
1500	60	0002	02-28	JV0213101	V0017220	NEW YORK TIMES	PAYMENT ACJU	55.50
1500	60	0002	03-01	I0834840	AJ798550	LEGISLATIVE ADM SERVICES	PAY W/C EACU	175.00
1500	60	0002	03-14	V02841801	AJ798630	KYLE THOMPSON	PAY W/C EACU	40.37
1500	60	0002	03-22	I0835780	AJ798640	SECRETARY OF STATE	PAY W/C EACU	65.00
DEPT-NUM TOTAL								756.68
1501 EXECUTIVE VICE CHANCEL								
1501	79	0002	01-13	S21184C01		INFO	FULL PAY SER	825.00
1501	60	0002	01-10	V04238701	AJ140530	CHRONICLE OF HIGHER ED	PAY W/C EACU	40.00
1501	60	0002	01-05	AJ1406201		AMER ASSN FOR HIGHER EDUC	AGENCY P.O.	40.00
DEPT-NUM TOTAL								905.00
1502 BUSINESS AFFAIRS								
1502	60	0002	01-13	V00144501	AJ359110	CHRONICLE OF HIGHER ED	PAY W/C EACU	36.00
1502	60	0002	01-26	V00144201	AJ349310	WALL STREET JOURNAL	PAY W/C EACU	89.00
1502	60	0002	01-17	AJ1342601	AJ134265	1114/500	EACUMB ADJ/C	16.00-
1502	60	0002	01-14	AJ1342661		1114/500	EACUPB ACCRA	16.00
1502	60	0002	01-17	I0835601	AJ693570	SECRETARY OF STATE	PAY W/C EACU	65.00
1502	60	0002	01-21	V02587801	AJ693620	ASSOC COLLEGE UNIV CORP	PAY W/C EACU	75.00
DEPT-NUM TOTAL								247.50
1508 OFFICE OF INFORMATICA								
1508	60	0002	01-24	V05638201	AK056330	IBM CORP	PAY W/C EACU	64.80
DEPT-NUM TOTAL								64.80

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produced--one list had only memberships and the other had only subscriptions. The list of memberships was then used as input to step 3. The list of subscriptions was merged with the list of automatically eliminated subscriptions in step 1. Future reports created in step 1 will be more compact because they will use this merged list.

Step 3: In the third step, memberships data were entered into a MULTIPLAN spreadsheet. Memberships titles were entered alphabetically. Other data included five year's worth of dues paid to each association. Even though the entry of text was awkward in MULTIPLAN, it was extremely useful when summary and grand totals were taken. The report showed five years of memberships dues in a columnar fashion. There is enough space left to add at least two more fiscal years of data on the printed report. New memberships will be easy to add in the future. The Executive Vice-Chancellor found this report easy to read and especially useful in tracking over time the types of memberships which prevailed. An example of the report produced by step 3 is found in figure 3.

Reasons for Conducting the Study as Described

- Step 1 could not have been performed on any other computing tool available. The IBM 370 acts as the host computer for all of the university's administrative data. Most of this information is stored in large databases. This configuration of data storage necessitated the extraction of the data for the memberships study on the mainframe.

- The list of vendors in step 1 must be checked each year so that no new memberships are mistakenly identified as subscriptions and vice versa. This identification must be done manually.

- Either the mainframe or the microcomputer could have

FIGURE 3

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LIST OF MEMBERSHIPS IN
NATIONAL, REGIONAL, STATE, AND PRIVATE ASSOCIATIONS
Fiscal Years 1977-1980, 1983

ORGANIZATION	1977 DUES	1978 DUES	1979 DUES	1980 DUES	1983 DUES
Accreditation Board for Engineering and Technology	0	0	0	0	250
ACUTA	0	0	0	0	60
Aerospace Educ Assoc	0	0	0	0	25
Alliance Francaise	25	25	25	25	0
Amer Academy in Rome	250	250	250	250	375
Amer Arts Alliance Inc.	0	272	0	0	0
Amer Assembly of Collegiate Schools of Business	1100	1100	1400	1400	1850
Amer Assoc for the Advancement of the Humanities	0	0	100	100	0
Amer Assoc for the Advancement of Science (Biochemistry - Borchardt)	0	0	0	0	48
Amer Assoc for the Advancement of Science (Biochemistry - Houston)	0	0	0	0	63
Amer Assoc for the Advancement of Science (Biochemistry - Sze)	0	0	0	0	48
Amer Assoc for the Advancement of Science (Entomology)	0	31	0	0	0
Amer Assoc for the Advancement of Science (Instructional Resources)	0	31	0	0	0
Amer Assoc for the Advancement of Science (Medicinal Chemistry - Swartz)	0	0	0	0	48
Amer Assoc for the Advancement of Science (Physiology and Cell Biology - Beutler)	0	0	0	0	53

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generated the final report. The decision to use the microcomputer to store the selected data and to produce the final report was based upon the following considerations:

- Software on the microcomputer was user-friendly and permitted non-programming staff to do report formatting and calculation of cost totals.
- Those staff members who had previously done this report by hand found it satisfactory to enter the memberships onto the spreadsheet because it was faster than typing them. Furthermore, the memberships data will remain permanently on the file for future use and quick reference.
- Data entry, updates and revisions on the spreadsheet were more user-friendly than they would have been on the IBM.

The use of the micro-computer was cost-effective for several reasons:

- There was no overhead charge on the use of the microcomputer as there is for use of the mainframe such as processing time, job set-up charges and output delivery.
- The costly intervention of programmers was not necessary. They were freed to work on other projects.
- The interactive capabilities of the spreadsheet permitted data corrections to be made with little effort. The report was revised and reprinted rather than retyped. This made for fast turn-around for subsequent double-checking and proofing.
- Documentation of the final report became the responsibility of the microcomputer user, not the programming staff.
- The spreadsheet contained both the data and the formatted report whereas the same report produced on the mainframe would have required two files--one for data and the program to create the report.

The evaluation of the computing tools selection by staff and the feedback from end-users was favorable. The staff indicated that some improvements could be made when the report is produced again. Suggestions were to place titles and dates on the report in the text-editor (WordStar) rather than on the actual spreadsheet, and to include a department code that would permit a sorting of the memberships by department or area of responsibility.

GOALS

As a result of the experiences in dealing with the mainframe and the microcomputer, the following short-term goals have been set in Institutional Research and Planning at the University of Kansas:

1) Encourage non-programming staff to design report models based upon their knowledge of user-friendly software on the microcomputer.

2) Place frequently accessed information on microcomputer storage devices.

3) Incorporate "what if" probes using interactive spreadsheets into routine analyses of data.

4) Create a standardizations manual that will outline steps to be taken in placing an application on the microcomputer.

5) Revise documentation of mainframe and microcomputer applications so that data references and names concur when there is common information.

In addition to these short-term goals, the following long-term goals have been identified:

1) Review software that will increase data management efficiency on the microcomputer.

2) Investigate microcomputer compatibility on campus so that information is more effectively exchanged and distributed.

3) Explore the graphics capabilities of the present microcomputer configuration.

4) Show support for the downloading of data from mainframe to microcomputer.

SUMMARY

This paper has focused on general considerations, specific guidelines and applications that have evolved from experiences with the mainframe system and microcomputer available in the Office of Institutional Research and Planning at the University of Kansas. The general considerations set the stage for an approach to computers regarding expectations, attitudes and organizational habits. The guidelines summarized in table 1 were discussed individually to point out the strengths and weaknesses of mainframe systems and microcomputers. An example application was presented to show how the guidelines and user-experience helped determine where data could be most effectively and efficiently managed. Finally, some short-term and long-term goals were outlined. These goals were a result of the process of defining what has been done so far and what still needs to be done.

NOTES

1. Wilson, Blaine, "Don't Buy A PC Until You've Read This," Modern Office Technology, October 1983, p. 159.

2. Pogrow, Stanley, "Microcomputerizing Your Paperwork," Electronic Learning, September 1982, p. 58.

3. Gates, Reginald, "Installing a Micro--The Hidden Costs," Interface Age, October 1982, p.112.

4. Pogrow, Stanley, "Microcomputerizing Your Paperwork," Electronic Learning, September 1982., p. 58.

5. Gabel, David, "Swapping Data," Personal Computing, September, 1983, p. 104.

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